Evaluating BMP Effectiveness at 3 Lake Michigan Beaches

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Study Locations

- **Jeorse Park Beach (IN)**
  - impacted by Grand Calumet River, birds, algae.
- **63rd Street Beach (IL)**
  - Birds, algae, ?
- **North Beach (WI)**
  - Urban runoff, birds, algae

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Have GLRI restoration activities been successful?

- Restoration activities
  - Gull deterrence (North, 63rd, Jeorse)
  - Dune plantings (North, 63rd)
  - Circulation modification (63rd, Jeorse – planned)
  - Storm water modification (North)
  - Beach Grooming/berm (North)

- Comparisons with pre-restoration conditions
  - First year of study

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Hydrodynamics and Water Quality

- Continuous monitoring
  - Nearshore currents using acoustic Doppler velocity meters (ADVMs)
  - Water quality (T, SC, DO, Turb., pH) using multiparameter sondes
- Synoptic surveys
  - Velocity mapping with acoustic Doppler current profilers (ADCPs)
  - Autonomous underwater vehicle (AUV) surveys
    - 3-D water quality distributions (T, SC, DO, pH, Turb., Chlorophyll, Blue-green s)
    - Bathymetry
    - Side scan sonar

Biological Response

- Water samples collected 3 days/week
  - *E. coli*
  - DNA markers (human, gull, dog)
  - Microbial communities (metagenomics)
- Modified sanitary survey
  - Bird counts and identification
- River impacts (Jeorse Park and North)
  - Dry/Wet event sampling rivers and beaches
  - Microbial communities

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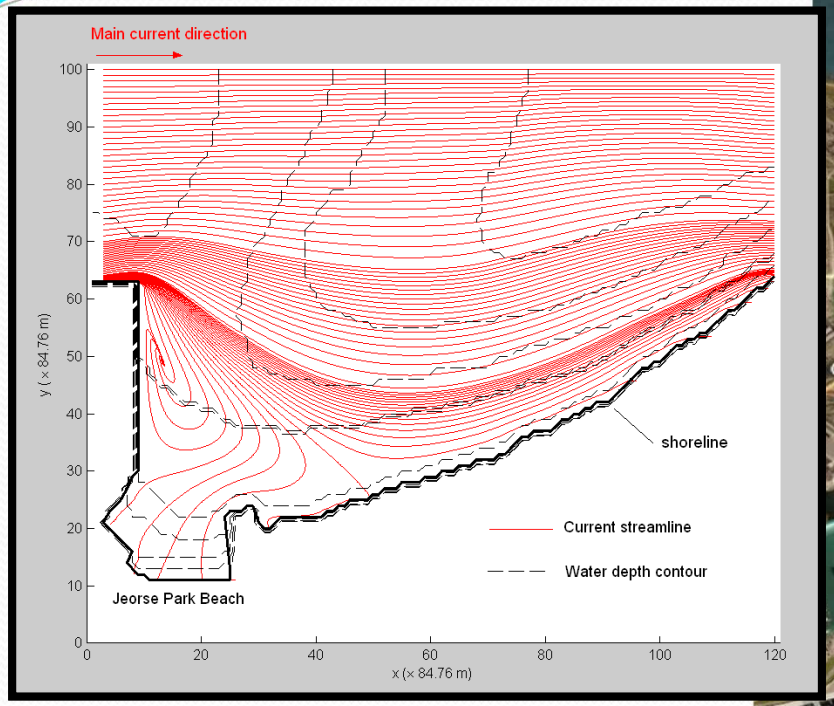
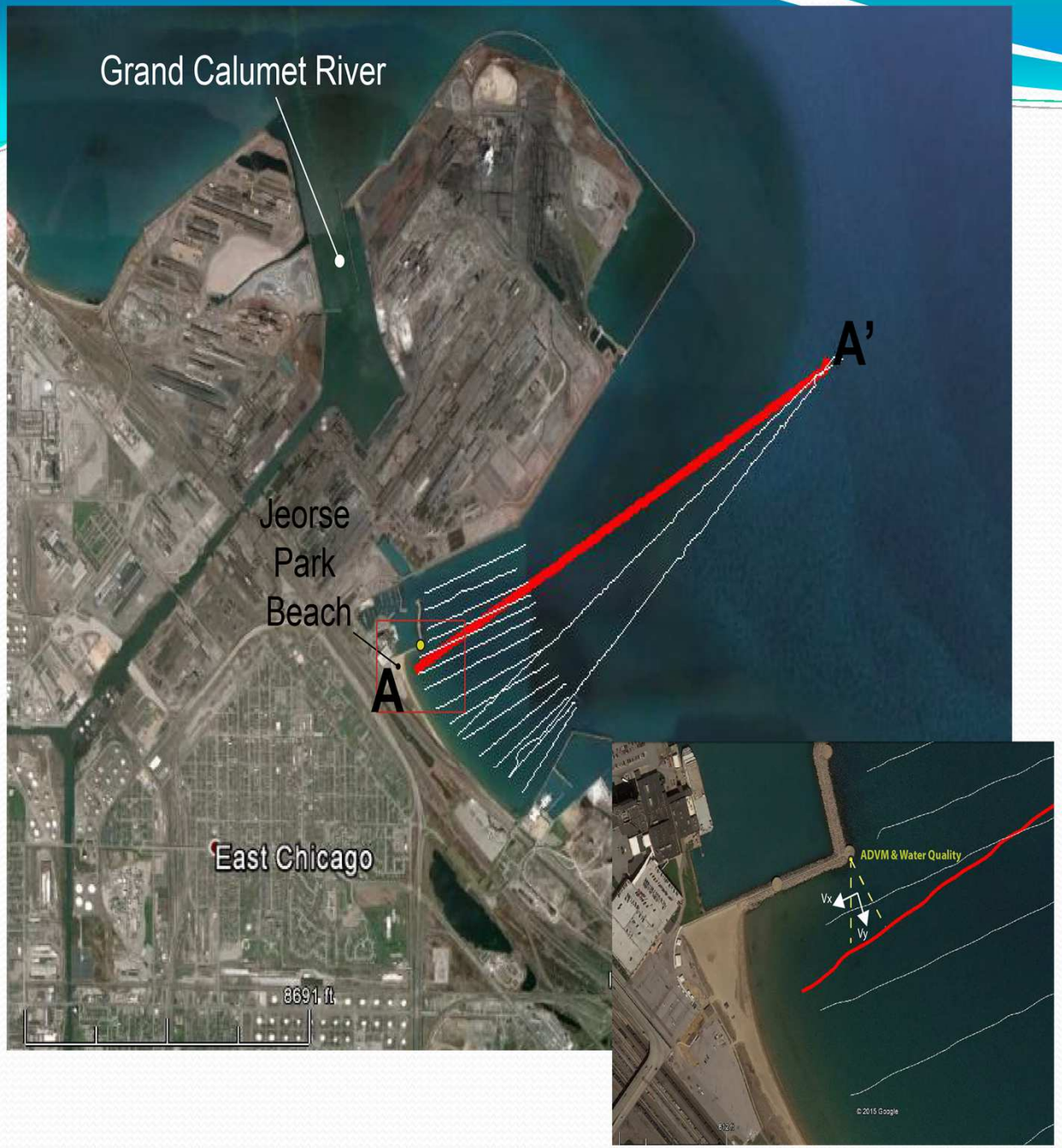
Jeorse Park



Debris, algae, pollutants caught in slack area of beach.

Transects


Grand Calumet River
A'
Jeorse
Park
Beach
A
East Chicago
8691 ft

ADVM & Water Quality
Vx
Vy
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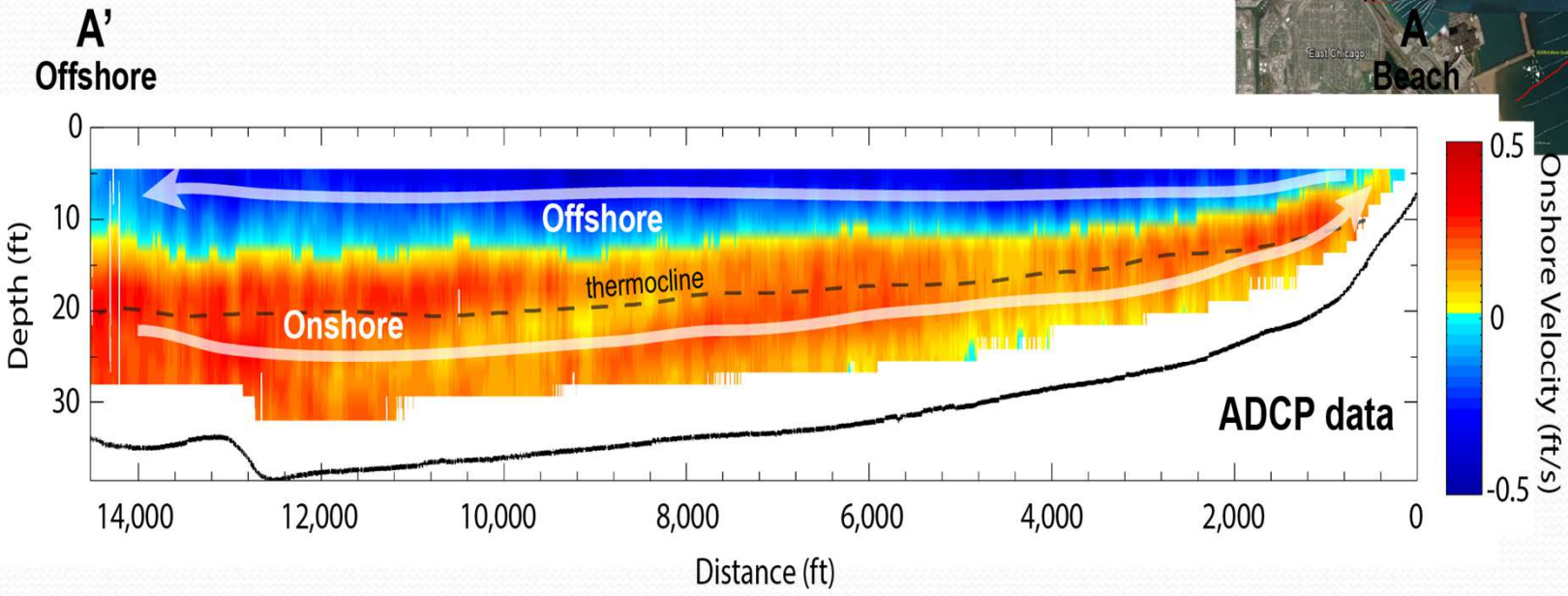
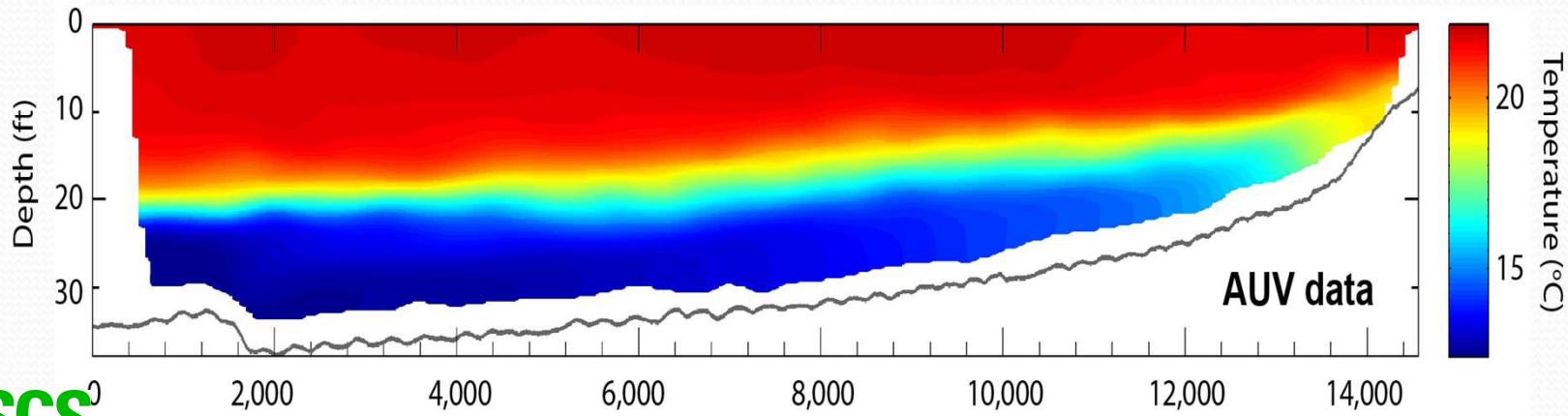
Jeorse Park Beach





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Preliminary data subject to r

Shore Bird Fecal Contamination

Geese

Cormorants

Gulls

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Restoration Approach: Redesign Beach

Increase Flow

63rd Street Beach (IL) is largely affected by birds, algae

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Debris and pollution accumulates along beach area

Beach water is stagnant and contaminants are tramped.

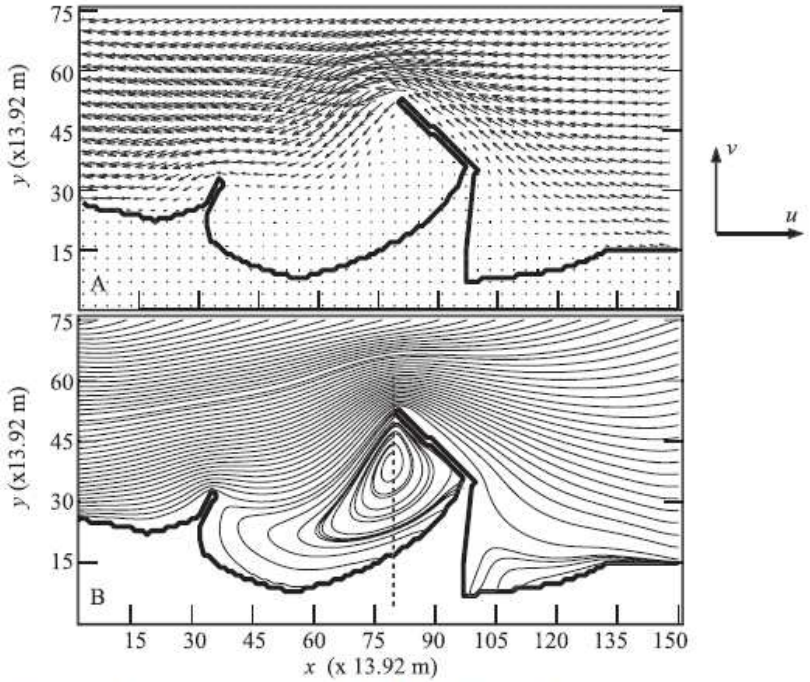
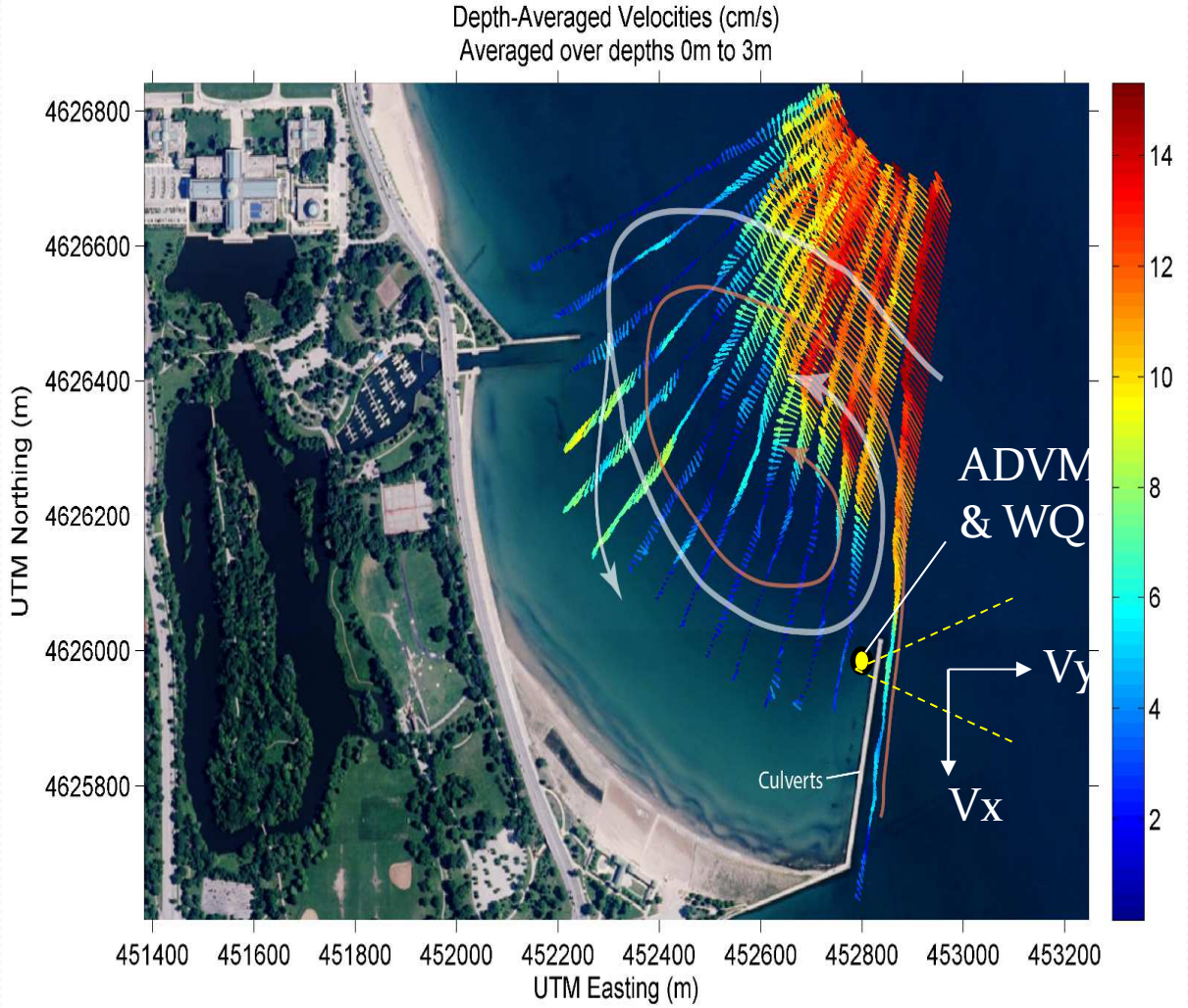


Fig. 4. Current pattern around the study beach driven by an upcoast longshore current entering the computational domain through the offshore (top) boundary with $u = -0.15$ m s^{-1}

63rd Street Beach



Near-surface velocities 0 to 3 m cm/s

Preliminary data subject to r

North Beach Sampling Locations (N1 – N4)

Wetland retention/infiltration cells

Beach Grooming

Algal bloom – North Beach

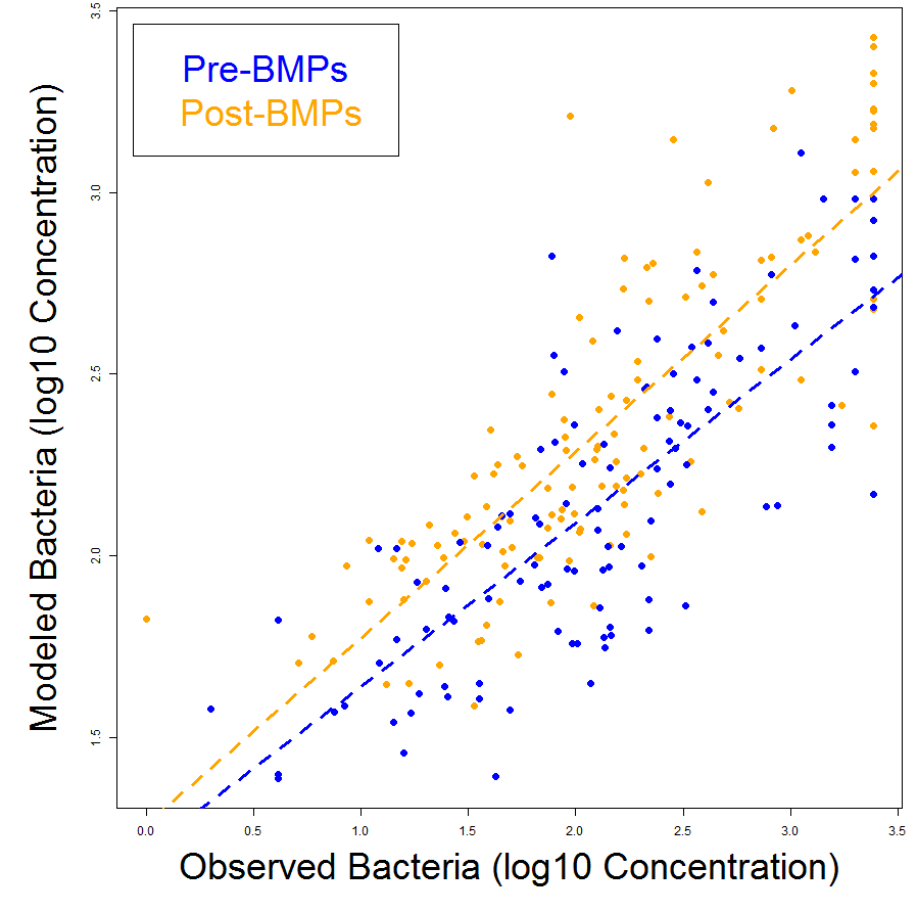
Detection of water quality change

Examples of environmental factors that influence beach water quality

- Turbidity
- Rainfall
- Air and water temperature
- Birds
- Algae
- Tributaries
- Currents
- Waves
- Water level
- Sunlight
- Wind

- All of these factors can vary by year, potentially influencing bacteria concentrations at beaches as well
- Variability of this type can confound assessment of BMPs when only considering concentrations

Example of model for assessment of ambient & water quality change



- Model of E. coli predicted with environmental variables: Rainfall, turbidity, wave height, cloud cover
- Calibrate with Pre + Post data
- Analyze change in water quality by comparing residuals between the time periods

Chicago Crescent Initiative (CCI)

USGS science applied to management of the ultra-nearshore coastal zone

CCI intersects USGS science across urban impacted landscapes of Lake Michigan to support sustainable management of coastal water and ecosystem resources

CCI benefits urban coasts and 12.4 million people in CCI along 160 mile shore

- Recreational, drinking, economic water uses
- Nearshore and onshore habitat, wildlife and lands
- Food web role in sustaining ecosystem resources
- Preventing invasives, chemical and biological contaminants from degrading resources

Questions?


Racine, WI
Kenosha, WI
Waukegan, IL
Milwaukee, WI
(21 miles north)
Lake Michigan
Chicago, IL
Gary, IN
Michigan
City, IN